CORRECTED VERIFIED TRANSLATION

I, Shinya Miyamoto of Ark Mori Building, 13F, 12-32, Akasaka 1-chome, Minato-ku, Tokyo 107-6013, Japan, do hereby certify that I am conversant with the English and Japanese languages and am a competent translator thereof, and I further certify that to the best of may knowledge and belief the attached translation for JP 2003-097080 is at true and correct translation made by me of the document in the Japanese language attached hereto.

Signed this 27th day of April, 2006

Shinya Miyamoto

PATENT OFFICE

Japanese Government

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[Designation of Document] Specification
[Title of the Invention] Headlamp for Vehicle
[Claims]
[Claim 1] A headlamp for a vehicle constituted to form a light distribution pattern having a horizontal cutoff line by a first reflecting optical system comprising a first light source including a semiconductor light emitting unit in which an almost rectangular light emitting chip is covered with an almost hemispherical mold lens and a first reflector for reflecting a light emitted from the first light source toward a front part of a lighting unit,

wherein the first light source is provided in such a manner that the light emitting chip is turned in an almost horizontal direction with one side of the light emitting chip set almost horizontally, and

the first reflecting optical system is constituted to form the horizontal cutoff line by selectively utilizing a light emitted from the first light source and reflected by the first reflector which is reflected in a reflecting region positioned in an almost front direction of the light emitting chip.

[Claim 2] The headlamp for a vehicle according to claim 1, which is constituted to form a light distribution pattern having an oblique cutoff line rising from the horizontal cutoff line at a predetermined angle by a second reflecting optical system comprising a second light source including a semiconductor light emitting unit in which an almost rectangular light emitting chip is covered with an almost hemispherical mold lens and a second reflector for reflecting a light emitted from the second light source toward a front part of a lighting unit,

wherein the second light source is provided in such a manner that the light emitting chip is turned in a direction which is downward inclined at the predetermined angle with respect to a horizontal direction with one side of the light emitting chip set almost horizontally, and

the second reflecting optical system is constituted to form the oblique cutoff line by selectively utilizing a light

emitted from the second light source and reflected by the second reflector which is reflected in a reflecting region positioned in an almost front direction of the light emitting chip.

[Claim 3] The headlamp for a vehicle according to claim 2, wherein the first reflector and the second reflector are formed integrally.

[Detailed Description of the Invention]

[0001]

[Technical Field to which the Invention Belongs]

The present invention relates to a headlamp for a vehicle which is constituted to form a light distribution pattern having a horizontal cutoff line by a reflecting optical system comprising a light source including a semiconductor light emitting unit.

[0002]

[Prior Art]

In a marker lamp for a vehicle such as a tail lamp, conventionally, a light emitting diode has often been used as a light source thereof.

[0003]

For example, "Patent Document 1" has described a marker lamp for a vehicle in which a plurality of lighting units using light emitting diodes as light sources is arranged.

[0004]

[Patent Document 1]

JP-A-2001-332104

[Problems that the Invention is to Solve]

In recent years, the luminance of a light emitting diode has been enhanced. Therefore, there is a growing tendency to employ the light emitting diode as the light source of a headlamp for a vehicle.

[0005]

However, a large number of light emitting diodes have such a structure that an almost rectangular light emitting chip is covered with an almost hemispherical mold lens as described in the "Patent Document 1". In the case in which the light emitting

diode is employed as the light source of the headlamp for a vehicle, therefore, there are the following problems.

[0006]

More specifically, in the headlamp for a vehicle, it is necessary to employ a structure in which a light distribution pattern having a horizontal cutoff line can be formed so as not to give a glare to a driver in a car running in an opposite direction. In that case, the light distribution pattern is formed as the aggregate of the inverted image of a light source in a headlamp for a vehicle having a reflecting optical system which reflects a light emitted from the light source toward the front part of a lighting unit by a reflector. At this time, however, the image of a light emitting chip is greatly deformed depending on the position of a light incidence on the reflector by the convex lens action of a mold lens. Therefore, a horizontal cutoff line cannot be formed clearly. For this reason, there is a problem in that the generation of a glare cannot be suppressed effectively.

[0007]

In consideration of such circumstances, it is an object of the invention to provide a headlamp for a vehicle capable of effectively suppressing the generation of a glare in the case in which a light distribution pattern having a horizontal cutoff line is formed by a reflecting optical system comprising a light source including a semiconductor light emitting unit.

[0008]

[Means for Solving the Problems]

In the invention, it is possible to achieve the object by devising the structure of a reflecting optical system.

[0009]

More specifically, the invention provides a headlamp for a vehicle constituted to form a light distribution pattern having a horizontal cutoff line by a first reflecting optical system comprising a first light source including a semiconductor light emitting unit in which an almost rectangular light emitting chip is covered with an almost hemispherical mold lens and a first

reflector for reflecting a light emitted from the first light source toward a front part of a lighting unit,

wherein the first light source is provided in such a manner that the light emitting chip is turned in an almost horizontal direction with one side of the light emitting chip set almost horizontally, and

the first reflecting optical system is constituted to form the horizontal cutoff line by selectively utilizing a light emitted from the first light source and reflected by the first reflector which is reflected in a reflecting region positioned in an almost front direction of the light emitting chip.

[0010]

It is a matter of course that the "light distribution pattern having a horizontal cutoff line" may be a so-called light distribution pattern for a low beam, and other light distribution patterns may be used.

[0011]

The type of the "semiconductor light emitting unit" is not particularly restricted but a light emitting diode or a laser diode can be employed, for example.

[0012]

While the "first light source" has the light emitting chip provided in the almost horizontal direction, the specific orientation of the almost horizontal direction is not particularly restricted but it is possible to employ a destination toward the side of the lighting unit or an inclined destination to the side of the lighting unit in a longitudinal direction, for example.

[0013]

[Function and Advantage of the Invention]

As shown in the structure, the invention provides a headlamp for a vehicle constituted to form a light distribution pattern having a horizontal cutoff line by a first reflecting optical system comprising a first light source including a semiconductor light emitting unit in which an almost rectangular light emitting chip is covered with an almost hemispherical mold

lens and a first reflector for reflecting a light emitted from the first light source toward a front part of a lighting unit, wherein the first light source is provided in such a manner that the light emitting chip is turned in an almost horizontal direction with one side of the light emitting chip set almost horizontally, and the first reflecting optical system is constituted to form the horizontal cutoff line by selectively utilizing a light emitted from the first light source and reflected by the reflector which is reflected in a reflecting region positioned in an almost front direction of the light emitting chip. Therefore, the following functions and advantages can be obtained.

[0014]

More specifically, the almost rectangular light emitting chip is turned in the almost horizontal direction with the side set almost horizontally. Therefore, the inverted image of the first light source which is formed on a virtual vertical screen provided in the forward part of the lighting unit by the light reflected in the reflecting region positioned in the almost front direction of the light emitting chip becomes an almost rectangular image having an upper edge extended almost horizontally. If the almost rectangular image is utilized to form the horizontal cutoff line, accordingly, it is possible to form a clear horizontal cutoff line. Consequently, the generation of a glare can be suppressed effectively.

[0015]

According to the invention, thus, the generation of a glare can be suppressed effectively in the headlamp for a vehicle which is constituted to form the light distribution pattern having the horizontal cutoff line by the reflecting optical system comprising the light source including the semiconductor light emitting unit.

[0016]

The headlamp for a vehicle is often constituted to form the light distribution pattern having an oblique cutoff line rising from the horizontal cutoff line at a predetermined angle

in order to maintain the distant visibility of a self-car driver and to prevent the glare from being given to a driver in a car running in an opposite direction. In that case, such a light distribution pattern can also be formed by a second reflecting optical system comprising a second light source including a semiconductor light emitting unit and a second reflector for reflecting a light emitted from the second light source toward the front part of a lighting unit.

[0017]

In this case, if the second light source is provided in such a manner that the light emitting chip is turned in a direction which is downward inclined at the predetermined angle with respect to the horizontal direction with one side of the light emitting chip set almost horizontally, and furthermore, the second reflecting optical system is constituted to form the oblique cutoff line by selectively utilizing the light emitted from the second light source and reflected by the second reflector which is reflected in the reflecting region positioned in the almost front direction of the light emitting chip, the following functions and advantages can be obtained.

[0018]

More specifically, the almost rectangular light emitting chip is turned in the direction which is downward inclined at the predetermined angle with respect to the horizontal direction with one side thereof set almost horizontally. Therefore, the inverted image of the light source which is formed on the virtual vertical screen provided in the forward part of the lighting unit by the light reflected in the reflecting region positioned in the almost front direction of the light emitting chip becomes an almost rectangular image having an upper edge rising at the predetermined angle in the horizontal direction. If the almost rectangular image is utilized to form the oblique cutoff line, accordingly, it is possible to obtain a clear oblique cutoff line. Consequently, the distant visibility of a self-car driver can be maintained, and furthermore, the generation of a glare can be suppressed effectively.

[0019]

In this case, the second reflector may be constituted separately from the first reflector. If the second reflector is formed integrally with the first reflector, however, the positional relationship between the horizontal cutoff line and the oblique cutoff line can be decided. Moreover, the aiming regulation of the headlamp for a vehicle can be collectively carried out for both of the first and second reflecting optical systems.

[0020]

[Mode for Carrying Out the Invention]

An embodiment of the invention will be described below with reference to the drawings.

[0021]

Fig. 1 is a front view showing a headlamp 10 for a vehicle according to an embodiment of the invention, and Fig. 2 is a sectional view taken along a line II - II in Fig. 1.

[0022]

The headlamp 10 for a vehicle is a lighting unit constituted to form a light distribution pattern for a low beam, and comprises a reflector unit 12 and a transparent cover 14 attached to an opening portion on the front end of the reflector unit 12.

[0023]

The reflector unit 12 includes a first reflecting optical system 20 having a first light source 16 and a first reflector 18, and a second reflecting optical system 30 having a second light source 26 and a second reflector 28. Both of the first and second light sources 16 and 26 are constituted by light emitting diodes which are formed by covering rectangular light emitting chips 22 with hemispherical mold lenses 24, and are supported by a common holder 32. Moreover, the first and second reflectors 18 and 28 are formed integrally.

[0024]

The first light source 16 is provided in such a manner that the light emitting chip 22 is turned in a left and horizontal direction with one side of the light emitting chip 22 set

horizontally. On the other hand, the second light source 26 is provided in such a manner that the light emitting chip 22 is turned in a downward inclined direction at 15 degrees to a right and horizontal direction with one side of the light emitting chip 22 set horizontally.

[0025]

A reflecting surface 18a of the first reflector 18 is provided with a plurality of reflecting units 18s by setting, as a central axis, an optical axis Ax1 extended in a longitudinal direction to pass through the center position of the surface of the light emitting chip 22 in the first light source 16 and using, as a reference plane, a paraboloid of revolution setting the center position of the surface of the light emitting chip 22 to be a focal point. On the other hand, a reflecting surface 28a of the second reflector 28 is provided with a plurality of reflecting units 28s by setting, as a central axis, an optical axis Ax2 extended in a longitudinal direction to pass through the center position of the surface of the light emitting chip 22 in the second light source 26 and using, as a reference plane, a paraboloid of revolution setting the center position of the surface of the light emitting chip 22 to be a focal point.

[0026]

Fig. 3 is a perspective view showing a light distribution pattern PL for a low beam which is formed on a virtual vertical screen provided in a position placed forward apart from a lighting unit by 25 m with a light irradiated forward from the headlamp 10 for a vehicle.

[0027]

The light distribution pattern PL for a low beam is a left light distribution pattern having horizontal and oblique cutoff lines CL1 and CL2 on an upper edge thereof. . The light distribution pattern is formed as a synthetic light distribution pattern obtained by two light distribution patterns formed by means of the first and second reflecting optical systems 20 and 30. In the light distribution pattern PL for a low beam, the position of an elbow point E to be an intersection of both of the cutoff

lines CL1 and CL2 is set downward by approximately 0.5 to 0.6 degree of H-V to be a vanishing point in the front direction of the lighting unit, and a hot zone HZ to be a region having a high luminous intensity is formed in a slightly leftward position with respect to the elbow point E.

[0028]

In the light distribution pattern PL for a low beam, a horizontal cutoff line forming pattern Pa for forming the horizontal cutoff line CL1 is formed by a light reflected from a reflecting region Za positioned in the almost front direction of the light emitting chip 22 of the first light source 16 in the reflecting surface 18a of the first reflector 18. Horizontal cutoff line reinforcing patterns Pb and Pc for reinforcing the horizontal cutoff line forming pattern Pa are formed by a light reflected from a reflecting region Zb positioned on an outer peripheral side of the reflecting region Za and a light reflected from a reflecting region Zc positioned on an inner peripheral side thereof.

[0029]

In the light distribution pattern PL for a low beam, moreover, an oblique cutoff line forming pattern Pd for forming the oblique cutoff line CL2 is formed by a light reflected from a reflecting region Zd positioned in the almost front direction of the light emitting chip 22 of the second light source 26 in the reflecting plane 28a of the second reflector 28. Oblique cutoff line reinforcing patterns Pe and Pf for reinforcing the oblique cutoff line forming pattern Pd are formed by a light reflected from a reflecting region Ze positioned on an outer peripheral side of the reflecting region Zd and a light reflected from a reflecting region Zf positioned on an inner peripheral side thereof.

[0030]

Portions other than the oblique cutoff line forming patterns Pa and Pd and the oblique cutoff line reinforcing patterns Pb, Pc, Pe and Pf in the light distribution pattern PL for a low beam are formed by lights reflected from regions

other than the reflecting regions Za, Zb and Zc on the reflecting surface 18a and regions other than the reflecting regions Zd, Ze and Zf on the reflecting surface 28a.

[0031]

As described above, in the first and second reflecting optical systems 20 and 30, the horizontal cutoff line CL1 and the oblique cutoff line CL2 are formed by selectively utilizing the lights reflected from the first and second reflectors 18 and 28 which are reflected in the reflecting regions Za and Zd positioned in the almost front direction of the light emitting chips 22 of the first and second light sources 16 and 26. The reason is as follows.

[0032]

As shown in Fig. 4(a), when the light emitting diode constituting the first light source 16 is observed from an outside, the light emitting chip 22 is seen enlargingly by the convex lens action of the mold lens 24. At this time, the shape of the light emitting chip 22 is seen to be distorted greatly depending on a direction of the observation.

[0033]

More specifically, in Fig. 4(b), the light emitting chip 22 originally having a shape shown in a two-dotted chain line is seen enlargingly as shown in a solid line. In other words, when the first light source 16 is observed in a front direction, the light emitting chip 22 is seen with an almost rectangular shape maintained as shown in "seen in a direction of an arrow A" in Fig. 4(b). When the observation is carried out in a direction which is greatly shifted from the front direction, the light emitting chip 22 is seen to be greatly deformed like an almost trapezoidal shape as shown in "seen in a direction of an arrow B" or "seen in a direction of an arrow C" in Fig. 4(b). In that case, the shape of the light emitting chip 22 can be regarded to be almost rectangular within a range of an angle θ around the front direction of the light emitting chip 22. The angle θ has a value of approximately 50 degrees.

[0034]

As shown in Fig. 2, a region positioned within a range of the angle θ on the reflecting surface 18a of the first reflector 18 is set to be the reflecting region Za, and furthermore, a region positioned within a range of the angle θ on the reflecting surface 28a of the second reflector 28 is set to be the reflecting region Zd.

[0035]

The image of the first light source 16 is formed as an inverted image on the virtual vertical screen by the light reflected from the first reflector 18. At this time, if the reflecting surface 18a is a paraboloid of revolution, images Ia, Ib and Ic of the first light source 16 which are formed by the lights reflected from the reflecting regions Za, Zb and Zc have shapes obtained by rotating, by 180 degrees, the shape of the light emitting chip 22 which is shown in a solid line of Fig. 4(b) as shown in Fig. 5.

[0036]

In other words, the image Ia formed by the light reflected from the reflecting region Za becomes an almost rectangular image, and the images Ib and Ic formed by the lights reflected from the reflecting regions Zb and Zc become almost trapezoidal images. In that case, the image Ib formed by the light reflected from the reflecting region Zb is smaller than the image Ic formed by the light reflected from the reflecting region Zc depending on a difference in a distance from the light emitting chip 22 to each of the reflecting regions Za, Zb and Zc.

[0037]

The images Ia, Ib and Ic of the first light source 16 are actually formed as the horizontal cutoff line forming pattern Pa and the horizontal cutoff line reinforcing patterns Pb and Pc by the deflecting and diffusing functions of the reflecting units 18s formed on the reflecting surface 18a of the first reflector 18.

[0038]

In that case, the horizontal cutoff line forming pattern Pa is formed by downward deflecting the image Ia of the reflecting

region Za to a position in which an upper edge thereof is on the level with the horizontal cutoff line CL1 and carrying out deflection and diffusion in a horizontal direction. At this time, the image Ia takes an almost rectangular shape and the upper edge thereof is extended in an almost horizontal direction. Also in the horizontal cutoff line forming pattern Pa, therefore, the upper edge has a high contrast ratio. Consequently, it is possible to obtain the clear horizontal cutoff line CL1.

[0039]

Moreover, the horizontal cutoff line reinforcing patterns Pb and Pc are formed by downward deflecting the images Ib and Ic of the reflecting regions Zb and Zc to a position in which they are hidden under the horizontal cutoff line CL1 and carrying out deflection and diffusion in a horizontal direction. At this time, the images Ib and Ic take almost trapezoidal shapes and have upper edges extended obliquely. In the horizontal cutoff line reinforcing patterns Pb and Pc, therefore, the upper edges do not have high contrast ratios. Since the patterns Pb and Pc are hidden under the horizontal cutoff line CL1, however, a glare can be prevented from being generated. By the horizontal cutoff line reinforcing patterns Pb and Pc, it is possible to maintain a brightness under the horizontal cutoff line forming pattern Pa and on both sides in the horizontal direction.

[0040]

On the other hand, the image of the second light source 26 is formed as an inverted image on the virtual vertical screen by the light reflected from the second reflector 28. At this time, if the reflecting surface 28a is a paraboloid of revolution, images Id, Ie and If of the second light source 26 which are formed by the lights reflected from the reflecting regions Zd, Ze and Zf have shapes obtained by rotating, by 180 degrees, the shape of the light emitting chip 22 shown in the solid line of Fig. 4(b) in an inclination state of 15 degrees as shown in Fig. 6.

[0041]

In other words, the image Id formed by the light reflected

from the reflecting region Zd becomes an almost rectangular image, and the images Ie and If formed by the lights reflected from the reflecting regions Ze and Zf become almost trapezoidal images. In that case, the image Ie formed by the light reflected from the reflecting region Ze is smaller than the image If formed by the light reflected from the reflecting region Zf depending on a difference in a distance from the light emitting chip 22 to each of the reflecting regions Zd, Ze and Zf.

[0042]

The images Id, Ie and If of the second light source 26 are actually formed as the oblique cutoff line forming pattern Pd and the oblique cutoff line reinforcing patterns Pe and Pf by the deflecting and diffusing functions of the reflecting units 28s formed on the reflecting surface 28a of the second reflector 28.

[0043]

In that case, the oblique cutoff line forming pattern Pd is formed by downward deflecting the image Id of the reflecting region Zd to a position in which an upper edge thereof is on the level with the oblique cutoff line CL2 and carrying out deflection and diffusion in a direction which is inclined by 15 degrees with respect to a horizontal direction. At this time, the image Id takes an almost rectangular shape and the upper edge thereof is extended in a direction which is inclined by approximately 15 degrees with respect to the horizontal direction. Also in the oblique cutoff line forming pattern Pd, therefore, the upper edge has a high contrast ratio. Consequently, it is possible to obtain the clear oblique cutoff line CL2.

[0044]

Moreover, the oblique cutoff line reinforcing patterns Pe and Pf are formed by downward deflecting the images Ie and If of the reflecting regions Ze and Zf to a position in which they are hidden under the oblique cutoff line CL2 and carrying out deflection and diffusion in a direction which is inclined by 15 degrees with respect to the horizontal direction. At this time, the images Ie and If take almost trapezoidal shapes and

have upper edges extended in a different direction from the oblique cutoff line CL2. In the oblique cutoff line reinforcing patterns Pe and Pf, therefore, the upper edges do not have high contrast ratios. Since the patterns Pe and Pf are hidden under the oblique cutoff line CL2, however, a glare can be prevented from being generated. By the oblique cutoff line reinforcing patterns Pe and Pf, it is possible to maintain a brightness under the oblique cutoff line forming pattern Pd and on both sides in the oblique direction.

[0045]

As described above in detail, the headlamp 10 for a vehicle according to the embodiment is constituted to form a light distribution pattern having the horizontal cutoff line CL1 by the first reflecting optical system 20 comprising the first light source 16 including the light emitting diode in which the rectangular light emitting chip 22 is covered with the hemispherical mold lens 24 and the first reflector 18 for reflecting a light emitted from the first light source 16 toward the front part of the lighting unit. The first light source 16 is provided in such a manner that the light emitting chip 22 is turned in the horizontal direction with one side of the light emitting chip 22 set almost horizontally, and furthermore, the first reflecting optical system 20 is constituted to form the horizontal cutoff line CL1 by selectively utilizing a light emitted from the first light source 16 and reflected by the first reflector 18 which is reflected in the reflecting region Za positioned in the almost front direction of the light emitting chip 22. Therefore, the following functions and advantages can be obtained.

[0046]

More specifically, the light emitting chip 22 of the first light source 16 is formed rectangularly and is turned in the horizontal direction with the side set horizontally. Therefore, the inverted image of the first light source 16 which is formed on the virtual vertical screen provided in the forward part of the lighting unit by the light reflected in the reflecting region

Za positioned in the almost front direction of the light emitting chip 22 becomes the almost rectangular image Ia having an upper edge extended almost horizontally. In the embodiment, the almost rectangular image Ia is utilized to form the horizontal cutoff line forming pattern Pa. Consequently, it is possible to obtain the clear horizontal cutoff line CL1. Thus, the generation of a glare can be suppressed effectively.

[0047]

In the embodiment, moreover, a light distribution pattern having the oblique cutoff line CL2 rising obliquely from the horizontal cutoff line CL1 at 15 degrees is formed by the second reflecting optical system 30 comprising the second light source 26 including the light emitting diode in which the rectangular light emitting chip 22 is covered with the hemispherical mold lens 24 and the second reflector 28 for reflecting a light emitted from the second light source 26 toward the front part of the lighting unit. In that case, the second light source 26 is provided in such a manner that the light emitting chip 22 is turned in a direction which is downward inclined at 15 degrees with respect to the horizontal direction with one side of the light emitting chip 22 set horizontally, and furthermore, the second reflecting optical system 30 is constituted to form the oblique cutoff line CL2 by selectively utilizing a light emitted from the second light source 26 and reflected by the second reflector 28 which is reflected in the reflecting region Zd positioned in the almost front direction of the light emitting chip 22. Therefore, the following functions and advantages can be obtained.

[0048]

More specifically, the light emitting chip 22 of the second light source 26 is formed rectangularly and is turned in the direction which is downward inclined at 15 degrees with respect to the horizontal direction with the side set horizontally. Therefore, the inverted image of the second light source 26 which is formed on the virtual vertical screen provided in the forward part of the lighting unit by the light reflected in the reflecting

region Zd positioned in the almost front direction of the light emitting chip 22 becomes the almost rectangular image Id having an upper edge rising obliquely at 15 degrees with respect to the horizontal direction. In the embodiment, the almost rectangular image Id is utilized to form the oblique cutoff line forming pattern Pd. Consequently, it is possible to obtain the clear oblique cutoff line CL2. Thus, the distant visibility of a self-car driver can be maintained, and furthermore, the generation of a glare can be suppressed effectively.

[0049]

In the embodiment, furthermore, the first reflector 18 and the second reflector 28 are formed integrally. Therefore, the positional relationship between the horizontal cutoff line CL1 and the oblique cutoff line CL2 can be decided. Moreover, the aiming regulation of the headlamp 10 for a vehicle can be collectively carried out for both of the first and second reflecting optical systems 20 and 30.

[0050]

In the embodiment, when the horizontal cutoff line forming pattern Pa and the oblique cutoff line forming pattern Pd are to be formed, the image Ia of the reflecting region Za and the image Id of the reflecting region Zd are deflected downward to the position in which the upper edges thereof are on the level with the horizontal cutoff line CL1 and the oblique cutoff line CL2. The optical axes Ax1 and Ax2 may be previously set downward corresponding to the downward deflection. In such a case, the concavo-convex amount of each of the reflecting units 18s and 28s can be reduced. Consequently, it is possible to easily form the reflecting surfaces 18a and 28a.

[0051]

While the lights emitted from the first and second light sources 16 and 26 which are reflected by the first and second reflectors 18 and 28 are subjected to deflecting and diffusing control by the reflecting units 18s and 28s formed on the reflecting surfaces 18a and 28a in the embodiment, moreover, it is also possible to employ a structure in which a plurality

of lens units is formed on the transparent cover 14 and the deflecting and diffusing control is carried out by a refracting action thereof.

[0052]

While the headlamp 10 for a vehicle comprises one first reflecting optical system 20 and one second reflecting optical system 30 in the embodiment, furthermore, it is also possible to employ a structure in which the first and second reflecting optical systems 20 and 30 are provided in plural sets. In such a case, the light distribution pattern PL for a low beam can have a higher brightness.

[Brief Description of the Drawings]

Fig. 1 is a front view showing a headlamp for a vehicle according to an embodiment of the invention,

Fig. 2 is a sectional view taken along a line II - II in Fig. 1,

Fig. 3 is a perspective view showing a light distribution pattern for a low beam which is formed on a virtual vertical screen provided in a position placed forward apart from a lighting unit by 25 m with a light irradiation from the headlamp for a vehicle,

Fig. 4 is a view for explaining how to see a light emitting chip when a light emitting diode constituting a first light source of the head lamp for a vehicle is observed from an outside,

Fig. 5 is a view showing the image of the first light source and a horizontal cutoff line forming pattern which are formed on the virtual vertical screen by a light reflected from a reflecting region positioned in the almost front direction of the light emitting chip in a first reflector of the headlamp for a vehicle, and

Fig. 6 is a view showing the image of a second light source and an oblique cutoff line forming pattern which are formed on the virtual vertical screen by a light reflected from a reflecting region positioned in the almost front direction of the light emitting chip in a second reflector of the headlamp for a vehicle.

[Description of the Reference Numerals and Signs]

10 headlamp for vehicle
12 reflector unit
14 transparent cover
16 first light source
18 first reflector
18a reflecting surface
18s reflecting unit
20 first reflecting optical system
22 light emitting chip
24 mold lens
26 second light source
28 second reflector
28a reflecting surface
28s reflecting unit
30 second reflecting optical system
32 holder
Ax1, Ax2 optical axis
CL1 horizontal cutoff line
CL2 oblique cutoff line
HZ hot zone
Ia, Ib, Ic image of first light source
Id, Ie, If image of second light source
PL light distribution pattern for low beam
Pa horizontal cutoff line forming pattern
Pb, Pc horizontal cutoff line reinforcing pattern
Pd oblique cutoff line forming pattern
Pe, Pf oblique cutoff line reinforcing pattern
Za reflecting region positioned in almost front direction of light emitting chip of first light source
Zb, Zc reflecting region
Zd reflecting region positioned in almost front direction of light emitting chip of second light source
Ze, Zf reflecting region

[Designation of Document] Abstract

[Abstract]

[Problem] It is an object to effectively suppress the generation of a glare in a headlamp for a vehicle which is constituted to form a light distribution pattern having a horizontal cutoff line by a reflecting optical system comprising a light source including a semiconductor light emitting unit.

[Means for Resolution] There is provided a structure in which a light distribution pattern having a horizontal cutoff line is formed by a first reflecting optical system 20 comprising a first light source 16 including a light emitting diode in which a rectangular light emitting chip 22 is covered with a hemispherical mold lens 24 and a first reflector 18 for reflecting a light emitted from the first light source 16 toward a front part of a lighting unit. In that case, the first light source 16 is provided in such a manner that the light emitting chip 22 is turned in a horizontal direction with one side of the light emitting chip 22 set horizontally. The horizontal cutoff line is formed by selectively utilizing a light emitted from the first light source 16 and reflected by the first reflector 18 which is reflected in a reflecting region Za positioned in an almost front direction of the light emitting chip 22.

[Selected Drawing] Fig. 2

Fig. 4

(b) Seen in a direction of an arrow B

Seen in a direction of an arrow A

Seen in a direction of an arrow C